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- **Table 1: Details of physiological and behavioural changes reported in scientific studies on rabbit pain and analgesia** (NZW=New Zealand White, IV= Intravenous, IM=Intramuscular, SC=Subcutaneous, PO=Orally, d=Day, q12h=Every 12 hours, q24h=Every 24 hours, SRB= Compounded sustained-release formulation of buprenorphine, FCM= Faecal corticosterone metabolites)

Study	Rabbit number/Breed	Procedure	Analgesia	Physiological parameters	Outcome	Behavioural parameters	Outcome	Comments
Cooper et al. 2009	29/Dutch Belted	Ovariohysterectomy	3 groups: <ul style="list-style-type: none"> <li>• Buprenorphine 0.03 mg/kg IM q 12h for 2 d</li> <li>• Meloxicam 0.2 mg/kg SC q 24h for 2 d</li> <li>• 0.5% bupivacaine infused locally at the incision</li> </ul>	<ul style="list-style-type: none"> <li>• Haematology</li> <li>• Biochemistry</li> <li>• Body temperature</li> <li>• Body weight</li> <li>• Faecal output</li> <li>• Faecal flora</li> </ul>	<ul style="list-style-type: none"> <li>• No changes in body temperature, haematology, biochemistry and faecal flora during the study</li> <li>• Decrease in body weight and faecal output</li> </ul>	<ul style="list-style-type: none"> <li>• Food intake</li> </ul>	<ul style="list-style-type: none"> <li>• Decrease in food intake</li> </ul>	The changes in body weight, faecal output and food intake were found to be more severe when bupivacaine was used.
Leach et al. 2009	28/NZW	Ovariohysterectomy	4 groups: <ul style="list-style-type: none"> <li>• Meloxicam 0.2 mg/kg PO (Loding dose)</li> <li>• Meloxicam 0.6 mg/kg PO (Loding dose)</li> <li>• Meloxicam 1mg/kg PO (Loding dose)</li> <li>• Control group</li> </ul>	<ul style="list-style-type: none"> <li>• Body weight</li> </ul>	<ul style="list-style-type: none"> <li>• Decrease in body weight in all animals</li> </ul>	<ul style="list-style-type: none"> <li>• Inactive pain behaviour (Twitch, wince, stagger, flinch, press, pain, adjust low, shuffle)</li> <li>• Other behaviours (e.g. grooming, ear position, cage position, head shaking, etc)</li> </ul>	<ul style="list-style-type: none"> <li>• Increased inactive pain behaviour</li> <li>• Minimal differences of the Other behaviours</li> </ul>	Inactive pain behaviour was considered the most indicative of all the behaviours assessed during the study
Weaver et al. 2010	20/NZW	Ovariohysterectomy and telemeter implantation	4 groups: <ul style="list-style-type: none"> <li>• Buprenorphine 0.02 mg/kg</li> </ul>	<ul style="list-style-type: none"> <li>• Body weight</li> <li>• Faecal output</li> </ul>	<ul style="list-style-type: none"> <li>• Body weight decreased significantly in all animals</li> </ul>	<ul style="list-style-type: none"> <li>• Food and water intake</li> </ul>	<ul style="list-style-type: none"> <li>• Food and water intake decreased significantly in</li> </ul>	No statistical difference amongst the three

			<ul style="list-style-type: none"> <li>SC q12h for 3 d</li> <li>Fentanyl 25-<math>\mu</math>g patch placed 24h prior surgery</li> <li>Ketoprofen 1mg/kg SC q 24h for 3 d</li> <li>Control group</li> </ul>			<ul style="list-style-type: none"> <li>postoperative up to 7 days.</li> <li>Faecal output decreased significantly in all animals postoperatively</li> </ul>	<ul style="list-style-type: none"> <li>Travel distance</li> <li>Rearing activity</li> </ul>	<ul style="list-style-type: none"> <li>all animals postoperatively</li> <li>Travel distance and rearing activity decreased significantly in all animals postoperatively</li> </ul>	analgesic groups and the control group were found during the study
Farnworth et al. 2011	7/NZW	Abdominal implantation of a telemetric device	<p>All animals:</p> <ul style="list-style-type: none"> <li>Carprofen 2 mg/kg SC once</li> </ul>	-	-	<ul style="list-style-type: none"> <li>Several behaviours were recorded post operatively (e.g. grooming, exploring, lying, etc)</li> </ul>	<ul style="list-style-type: none"> <li>Decreased behaviours: <ul style="list-style-type: none"> <li>Grooming</li> <li>Food and water intake</li> <li>Exploring</li> <li>Stretching</li> <li>Others</li> </ul> </li> <li>New behaviours: <ul style="list-style-type: none"> <li>Full-body flex</li> <li>Hind leg shuffle</li> <li>Tight huddle</li> </ul> </li> <li>Increased behaviours: <ul style="list-style-type: none"> <li>Lying</li> <li>Drawing back</li> <li>Staggering</li> <li>Closed eyes</li> </ul> </li> </ul>	The authors stated that behavioural indicators of pain may differ depending on housing and surgical procedure	
Keating et al. 2012	8/NZW	Ear tattooing	<p>4 groups:</p> <ul style="list-style-type: none"> <li>Sham tattooing with EMLA cream®</li> <li>Sham tattooing without EMLA cream®</li> <li>Tattooing with EMLA cream®</li> <li>Tattooing without EMLA cream®</li> </ul>	<ul style="list-style-type: none"> <li>Heart rate</li> <li>Arterial blood pressure</li> <li>Serum corticosterone concentration</li> </ul>	<p>All the animals tattooed without EMLA cream:</p> <ul style="list-style-type: none"> <li>Increased heart rate</li> <li>Increased arterial blood pressure</li> </ul> <p>All animals with or without the EMLA cream®:</p> <ul style="list-style-type: none"> <li>Increased Serum corticosterone concentration</li> </ul>	<ul style="list-style-type: none"> <li>Facial expression</li> <li>Grooming</li> <li>Movement</li> <li>Rearing</li> <li>Vocalisation and struggling</li> </ul>	<ul style="list-style-type: none"> <li>Increased grooming was noticed only in the animals tattooed without EMLA cream®</li> <li>Movement and rearing decreased in all animals</li> <li>Rearing, vocalisation and struggling was noticed in</li> </ul>	The Rabbit Grimace Scale developed during this study provides a validated pain assessment tool in rabbits.	

								animals tattooed without EMLA cream ®	
Goldschlager et al. 2013	39/NZW	Vascular cut-down of the femoral artery		4 groups: <ul style="list-style-type: none"> <li>Buprenorphine 0.03 mg/kg SC q12h for 3 d</li> <li>Meloxicam 0.2 mg/kg SC q24h for 3 d</li> <li>Buprenorphine 0.01 mg/kg and meloxicam 0.1 mg/kg SC q 24h for 3 d</li> <li>Single dose of 0.5 ml of 0.5% bupivacaine infused locally</li> </ul>	<ul style="list-style-type: none"> <li>Faecal corticosterone metabolites (FCM)</li> <li>Faecal output</li> <li>Urine output</li> <li>Body weight</li> <li>Haematology</li> <li>Biochemistry</li> <li>Faecal flora</li> </ul>	In the buprenorphine-meloxicam group, FCM did not change while it increased in the other 3 groups In all animals: <ul style="list-style-type: none"> <li>Decreased faecal output</li> <li>Normal urine output</li> <li>Decreased body weight</li> <li>Normal range of haematology and biochemistry</li> <li>Normal faecal flora</li> </ul>	Food intake	All animals showed a decrease in food intake	The study suggests that a multimodal approach using a combination of buprenorphine and meloxicam may control pain better than meloxicam or buprenorphine given alone.
Hedenqvist et al. 2016	18/NZW	Bilateral axillary sinus augmentation		2 groups: <ul style="list-style-type: none"> <li>Buprenorphine 0.03mg/kg IV and 0.02 mg/kg SC (Loading dose) and carprofen 5 mg/kg SC q 24 h for 4 d</li> <li>Buprenorphine 0.03mg/kg IV and 0.02 mg/kg SC (Loading dose) and saline (NaCl)</li> </ul>	<ul style="list-style-type: none"> <li>Body weight</li> </ul>	<ul style="list-style-type: none"> <li>No difference between the two groups</li> </ul>	Facial expressions	<ul style="list-style-type: none"> <li>No differences between the two groups were found</li> </ul>	Facial expressions such as orbital tightening and ear positions were considered easy to evaluate by inexperienced people during the study
DiVincenti et al. 2016	24/NZW	Tibial titanium implants		2 groups: <ul style="list-style-type: none"> <li>Buprenorphine 0.02 mg/kg SC q12 h for 3 d</li> </ul>	-	-	<ul style="list-style-type: none"> <li>Grimace scale score</li> <li>Activity score</li> </ul>	In both groups: <ul style="list-style-type: none"> <li>Increased in Grimace score</li> <li>Decreased in activity score</li> </ul>	The two treatment groups were comparable during the

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- Compounded  
sustained-  
release  
formulation of  
buprenorphin  
e (SRB) 0.12  
mg/kg once
- 

study with no  
major  
adverse  
effects  
reported